## We claim:

- 1. A method of generating a model of a random field which has directionally varying continuity, comprising:
  - a) specifying a tentative model for said random field;
  - b) identifying connected strings of nodes within said model;
  - c) performing a spectral simulation on each of said strings of nodes;
- d) updating said tentative model with data values resulting from said spectral simulations.
- 2. The method of claim 1, wherein a grid of azimuths is used to identify said connected strings of nodes.
- 3. The method of claim 1, wherein said model is subdivided into layers, and steps b), c) and d) are performed on a layer-by-layer basis.
- 4. The method of claim 1, wherein for each of said strings of connected nodes said spectral simulation comprises:
  - a) determining a phase spectrum from a Fourier transform of said string;
- b) specifying an amplitude spectrum which represents the maximumdesired spatial continuity for said string; and
- c) inverse Fourier transforming said phase spectrum and said amplitude spectrum to determine updated data values for said nodes in said string.
- 5. The method of claim 4, wherein one or more of each of said strings is padded with additional data values prior to calculation of the Fourier transform of said string.
- 6. A method of generating a model of a random field which has directionally varying continuity, comprising:

- a) specifying a tentative model for said random field;
- b) for each of said layers,

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- [i] specifying a grid of azimuths for nodes in said model;
- [ii] using said grid to identify connected strings of nodes within said model;
- [iii] performing a spectral simulation on each of said strings of nodes, for each said string said spectral simulation involving the determination of a phase spectrum from a Fourier transform of said string, the specification of an amplitude spectrum which represents the maximum-desired spatial continuity for said string; and the inverse Fourier transform of said phase spectrum and said amplitude spectrum to determine updated data values for said nodes in said string; and
- [iv] updating said tentative model with data values resulting from said spectral simulations.
- 7. The method of claim 6, wherein one or more of each of said strings is padded with additional data values prior to calculation of the Fourier transform of said string.
- 8. The method of claim 1, wherein neighboring nodes to each said node in each said string of nodes are identified and further wherein said spectral simulation is multidimensional.
- 9. The method of claim 6, wherein neighboring nodes to each said node in each of said strings are identified and wherein said spectral simulation is two-dimensional.
- 10. The method of claim 1, wherein said tentative model is specified from a spectral simulation comprising
- a) determination of a phase spectrum from a Fourier transform of a first estimate of said tentative model;
  - b) specification of an amplitude spectrum for said tentative model; and

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- c) inverse Fourier transforming said phase spectrum and said amplitude spectrum to determine said tentative model.
- 11. The method of claim 10, where said amplitude spectrum characterizes the short-range continuity desired in said tentative model.
- 12. The method of claim 10, where said spectral simulation is applied on a layer-by-layer basis to each of one or more layers of said tentative model.
- 13. The method of claim 10, where said tentative model is specified from a three-dimensional spectral simulation.
- 14. The method of claim 13, wherein said identified strings of connected nodes are used to identify curtains of connected nodes, and two-dimension spectral simulation is applied to each of said curtains.
- 15. The method of claim 1, wherein a grid of dips is used to identify said strings of connected nodes.
- 16. The method of claim 1, wherein a combined grid of dips and azimuths are used in three-dimensions to identify said strings of connected nodes.